CLAIMS

WHAT IS CLAIMED IS:

1. A macromer comprising an oligomer consisting essentially of a plurality of repeating units each consisting essentially of a cross-linkable moiety bound to a polymer, wherein each of said cross-linkable moiety and said polymer are biocompatible.

2 The macromer according to claim 2 wherein each of said cross-linkable moiety and said polymer are non-toxic.

3. The macromer according to claim 1 wherein said polymer is a polyether.

4. The macromer according to claim 3 wherein said polyether is hydrophilic.

5. The macromer according to claim 4 wherein said polyether is poly(ethylene glycol).

6. The macromer according to claim 1 wherein said cross-linkable moiety comprises an unsaturated carbon bond between the ends of the cross-linkable moiety, wherein said ends have the same chemical composition.

7. The macromer according to claim 6 wherein said cross-linkable moiety is a fumaryl group.

8. The macromer according to claim 1 modified with a therapeutic agent.

9. The macromer according to claim 8 wherein said therapeutic agent comprising a biocompatible organic group selected from the group consisting of peptides, proteins, protein fragments, proteoglycans, glycoproteins, carbohydrates.

10. A macromer comprising oligo(poly(ethylene glycol) fumarate).

11. The macromer according to claim 9 modified with a biocompatible organic group selected from the group consisting of peptides, proteins, protein fragments, proteoglycans, glycoproteins, and carbohydrates.

12. The macromer according to claim 11 wherein the peptide is selected from the group consisting of RGD, YIGSR, REDV, IKVAV, and KRSR peptides.

13. The macromer according to claim 11 wherein the protein is selected from the group consisting of members of the transforming growth factor beta superfamily, bone morphogeneic proteins, basic fibroblast growth factor, platelet derived growth factor, insulin like growth factor, and extracellular matrix molecules including osteopontin, osteonectin, osteocalcin, and bone sialoprotein.

14. The macromer according to claim 11 wherein the protein fragments comprise fragments of the proteins selected from the group consisting of members of the transforming growth factor beta superfamily, bone morphogeneic proteins, basic fibroblast growth factor, platelet derived growth

factor, insulin like growth factor, and extracellular matrix molecules including osteopontin, osteonectin, osteocalcin, and bone sialoprotein, comprising 3-30 amino acids.

15. The macromer according to claim 11 wherein the carbohydrate is selected from the group consisting of starch, cellulose, and chitin.

16. A polymeric network comprising oligo(poly(ethylene glycol) fumarate).

17. The macromer according to claim 16 modified with a biocompatible organic group selected from the group consisting of peptides, proteins, protein fragments, proteoglycans, glycoproteins, and carbohydrates.

18. The polymeric network according to claim 16 comprising oligo(poly(ethylene glycol)) cross-linked with oligo(poly(ethylene glycol) fumarate).

19. The polymeric network according to claim 16 comprising oligo(poly(ethylene glycol)) cross-linked with at least one linker molecule.

20. The polymeric network according to claim 19 wherein said linker molecule comprises a polymer comprising at least one unsaturated carbon-carbon bond.

21. The polymeric network according to claim 20 wherein said linker molecule comprises a diacrylated polymer.

22. The polymeric network according to claim 21 wherein said diacrylated polymer is selected from the group consisting of poly(propylene fumarate) and poly(ethylene glycol).

23. The polymeric network according to claim 16 wherein said polymeric network is water-swellable.

24. A method of making a polymeric network comprising reacting PEG with a fumaryl compound in the presence of an organic base to form an oligo(PEG fumarate).

25. The method according to claim 24 wherein the polymeric network is water-swellable.

26. The method according to claim 25 wherein the wet to dry swelling ratio is tunable by varying the ratio of PEG to the fumaryl compound.

27. The method according to claim 25 wherein the wet to dry swelling ratio is tunable by varying the PEG molecular weight.

28. The method according to claim 24 further comprising cross-linking the fumaryl groups.

29. A method of making an OPF coupled to a therapeutic agent, comprising:

(a) providing an OPF;

(b) activating the OPF;

(c) coupling the therapeutic agent to the activated OPF; and

30. The method according to claim 29 wherein step (b) comprises dissolving dried OPF and a corresponding amount of 4-nitrophenylchloroformate in triethyl amine.

31. The method according to claim 29 wherein step (a) comprises forming the OPF by the reaction of fumaryl chloride with poly(propylene glycol).

32. The method according to claim 29 wherein the therapeutic agent comprises a biocompatible organic group is selected from the group consisting of peptides, proteins, protein fragments, proteoglycans, glycoproteins, and carbohydrates.

33. The method according to claim 25 further comprising:

(d) cross-linking the OPF with an unsaturated linker molecule.

34. The method according to claim 29 wherein the unsaturated linker comprises a polymer selected from the group consisting of PPF and PEG.